उपग्रह

UPAGRAH

NEWSLETTER

ಉಪಗ್ರಹ

Vol. 47, Issue 1 January-March 2018

इसरो उपग्रह केन्द्र, विमानपुर, बेंगलूरु - 17 **ISRO SATELLITE CENTRE,** VIMANAPURA, BENGALURU - 17 ಇಸ್ರೊ ಉಪಗ್ರಹ ಕೇಂದ್ರ, ವಿಮಾನಪುರ, ಬೆಂಗಳೂರು - 17

PSLV-C40 launches successfully Cartosat-2F, INS-1C & MICROSAT

Cartosat-2F Satellite

PSLV-C40/Cartosat-2F Satellite Mission was launched on Jan 12, 2018 at 09:29 Hrs (IST) from Satish Dhawan Space Centre, Sriharikota.

Cartosat-2F Satellite is the primary satellite carried by PSLV-C40. This remote sensing satellite is similar in configuration to earlier satellites in the series and is intended to augment data services to the users. Upagrah has featured a detailed article on Cartosat-2F on Page Three.

→ Contd. on Page-2

ISAC Welcomes Chairman, ISRO

ISAC bids adieu to former Chairman, ISRO

FROM THE UPAGRAH COMMITTEE'S DESK

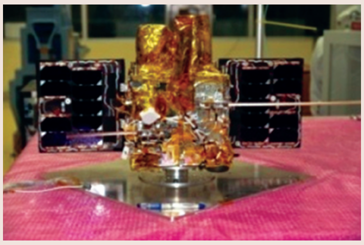
Endless possibilities and opportunities

The new editorial committee of Upagrah is here at the start of this whole new year! ISRO has been providing wonderful technical, managerial and administrative challenges which are offering endless opportunities and innumerable possibilities to bring to fruition the objectives of the Organisation. Though the first quarter had a set back, the team-ISRO which is full of optimism has immeasurable capabilities and will certainly realise all the targeted projects and keep this year too busy as always.

In addition to the above, Upagrah looks for regular contribution of articles from its readers to make every issue a collector's copy. In this issue, apart from the regular articles, we have a page exclusively for exposing our colleagues' hidden talents in other fields too. We hope to hear from you soon and would be glad to see you all on the pages of subsequent Upagrahs!

EDITORIAL COMMITTEE

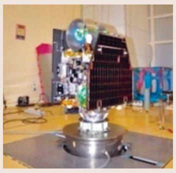
INDIAN NANO SATELLITE-1C (INS-1C)



Indian Nano Satellite-1C (INS-1C) is another Indian co-passenger payload of PSLV-C40. It is the third satellite in the Indian Nano satellite series. The first two satellites of this series were carried as co-passenger payloads by PSLV-C37 in February 2017. INS-1C carries Miniature Multispectral Technology Demonstration Payload from Space Applications Centre (SAC). Data sent by this camera is useful for topographical mapping, vegetation monitoring, aerosol scattering studies and cloud studies.

MICROSAT

PSLV-C40 also carried a Microsatellite (Microsat) built by ISRO Satellite Centre as a co-passenger payload. Microsat is a small satellite in the 100 kg class that derives its heritage from IMS-1 bus. This is a technology demonstrator and the fore runner for future satellites of this series. The satellite bus is modular in design and can be fabricated and tested independently of payload.



GSLV-F08 / GSAT-6A

GSAT6A, the multimedia communication satellite was launched onboard GSLV-F08 on March 29, 2018 at 16:56 Hrs (IST).

ANNIVERSARIES

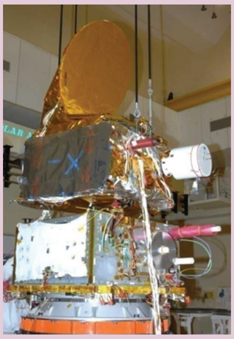
CARTOSAT-2D COMPLETES ONE YEAR IN-ORBIT

February 15, 2018

Cartosat-2D is an advanced remote sensing satellite that carries a Panchromatic Camera, Four-Band Multispectral camera operating in Time Delay Integration Mode and Event Monitoring Camera which can provide Video imageries of preselected sites.

SARAL COMPLETES FIVE YEARS IN-ORBIT

February 25, 2018



SARAL (Satellite with ARGOS and ALTIKA) Spacecraft is a Joint Indo-French satellite mission for Oceanographic studies. It performs altimetric measurements designed to study ocean circulation and sea surface elevation. The spacecraft and Payloads are providing valuable data for the user community.

IRNSS-1D COMPLETES THREE YEARS IN-ORBIT

March 28, 2018

IRNSS-1D, fourth satellite in NavIC was launched into a sub Geosynchronous Transfer Orbit (sub GTO) with a 284 km perigee and 20,650 km apogee with an inclination of 19.2 deg with respect to the equatorial plane.

AN EVENT NOT TO BE MISSED

Yet another lunar eclipse to watch out for in case you have missed the total lunar eclipse of 31 January this year !

28 July 2018 at 01:00 Hrs would give us another chance to witness a full lunar eclipse. A partial eclipse on 27 July 22:44hrs would be the prelude to this rare event. This lunar eclipse is happening when Moon is closest to the Earth as well as on the second full Moon of the month (called a blue moon). The next such event would happen only after 19 years, named as metonic cycle (19 solar years is 235 lunar months) after the discoverer Meton in 432 B.C.

(News from World Wide Web - Collected by Upagrah Committee)

CARTOSAT-2F SPACECRAFT

M A Sadananda Rao
Project Director Cartosat-2F

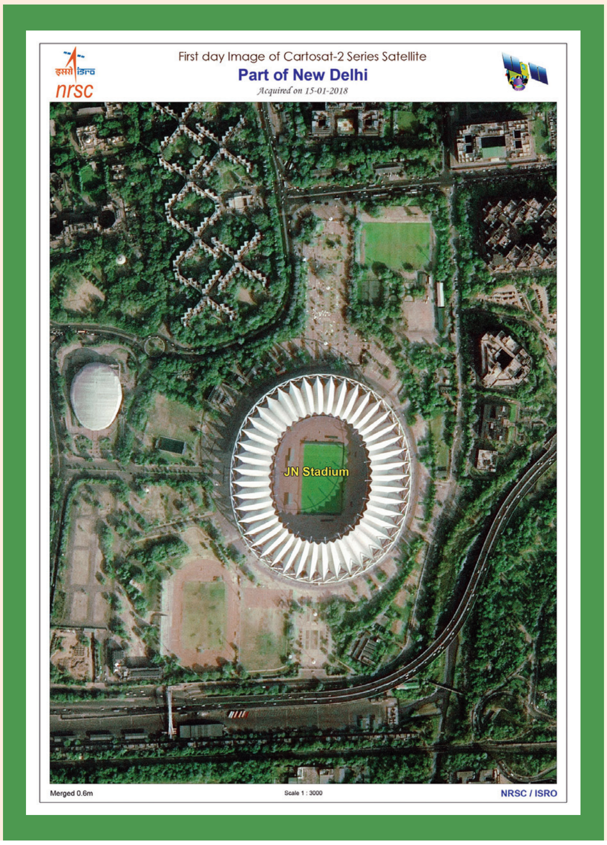
Cartost-2F, the seventh satellite of Cartosat-2 Series was launched by PSLV-C40 on 12th January 2018 at 9:29hrs IST from first launch pad of Satish Dhawan Space Center(SDSC) SHAR with 30 co-passenger satellites that included one Micro satellite and one Nano satellite from India. Spacecraft was successfully injected into a 505km polar sun synchronous orbit. The satellite has a design life of 5years.

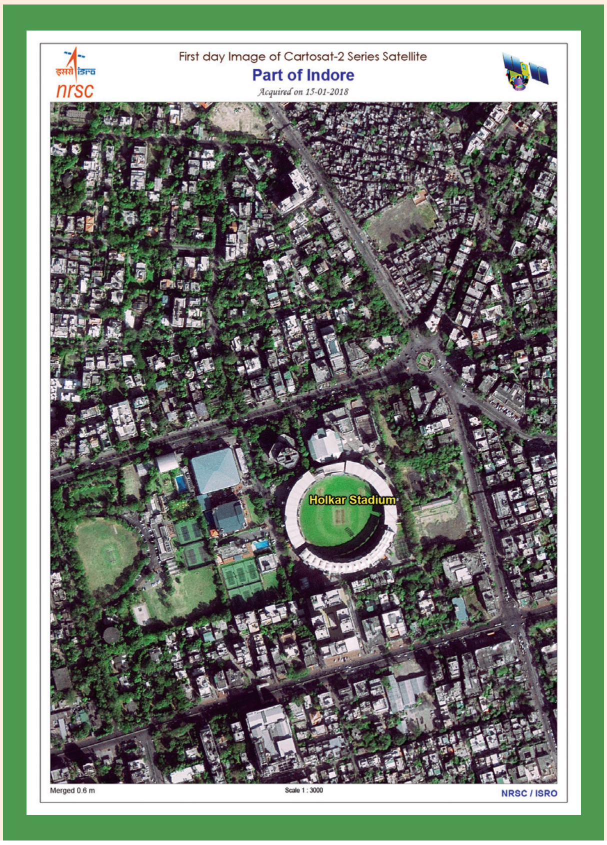
This is the fourth satellite in this series with multispectral and panchromatic camera. The payload also includes two event monitoring video imaging camera Ev1(Pan) and Ev2(RGB). The payload weighs about 120kg and is capable of delivering sub meter resolution images in panchromatic band and less than two-meter images in multispectral bands with a swath of 10km. The camera operates in time delay integration mode. The satellite imaging modes are (a) multispot imaging mode (b) paint brush mode for wider swath and (c) continuous strip imaging mode for longer strips with systematic coverage. Pan and Multispectral camera can be operated together for simultaneous acquisition of Pan and Mx images.

Overall configuration of Cartosat-2F is similar to Cartosat-2E. This three-axis stabilized agile platform has the capability of a long track steering to provide stereo spot imageries and a cross track steering of up to ±26 deg to enhance the range of spot imageries. Few minor changes in Cartosat-2F are (i) Usage of 50Ah Li-Ion LG cell battery (ii) SPS-10 is configured with GPS and NavIC channels with independent and combined mode of operation (iii) inclusion of NavIC based commanding interface with OBC.

Cartosat-2 Series programme has successfully demonstrated large number of new technologies. All the new technologies namely optical butting, DWT data compression, fusion mode of sensor operations, AOS commanding, Macro mode of operations, LP sequencing, Eclipse drag mode, Sliding redundancy concept and Launch pad initialization commands loading through EEPROM have been demonstrated successfully with repeat of performance. Similarly, onboard performance of in-house developed systems (i) CFRP payload structure(CMSE) (ii) RCS thrusterbed heaters (LPSC-B) (iii) 12-channel SPS (ISAC) (iv) NavIC based SPS with messaging has been normal. These technologies are forerunners for future high-resolution missions.

The initial phase operation of satellite has been completed successfully and Cartosat-2C, 2D, 2E and 2F are phased with 23 path separations to provide one-day revisit at 40deg latitude. Currently, the satellite is delivering quality images in Panchromatic and Multispectral bands. The images sent by the satellite will be useful for cartographic applications, urban and rural applications, coastal land use and regulation, utility management like road network monitoring, water distribution, creation of land use maps, change detection to bring out geographical and man made features and various other Land Information System and Geographical Information System applications. Further, the addition of this satellite into Cartosat-2S family has augmented the high-resolution imaging capability and is expected to meet the demands of user community.





3D PRINTING - AN OVERVIEW

Additive Manufacturing (AM) more commonly known as 3D printing has changed the philosophy of components realization. According to ASTM, AM is defined as "A process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies". AM differs from other manufacturing processes for several reasons and these differences lead to unique design opportunities and freedoms. Additive manufacturing is a manufacturing process based just on a 3D data set, a 3-dimensional virtual object, called a digital product model and uses layers of even thickness contoured according to corresponding cross sections of the product model. AM therefore basically is a 2-1/2 D process. At the bottom line of any 3D printing lies a 3D CAD model and AM is capable of reproducing the same irrespective of how complex it is.

Figure 1 shows the different process steps in 3D printing and figure 2 shows the different application levels of additive manufacturing. Rapid prototyping describes all applications that lead to prototypes, samples, models or mock-ups, while rapid manufacturing is used when final parts or even products are made.

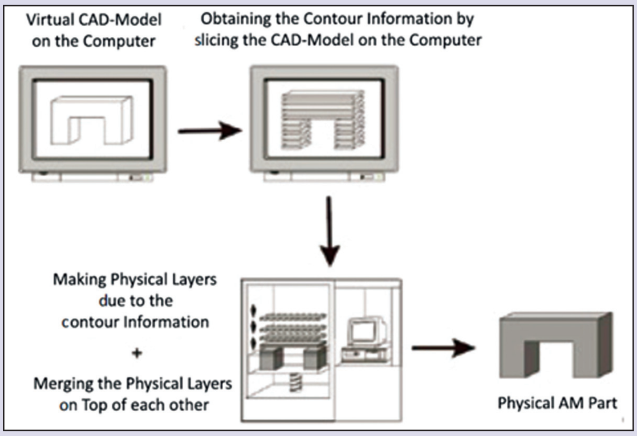

Virtual CAD-Model on the Computer
Obtaining the Contour Information by slicing the CAD-Model on the Computer
Making Physical Layers due to the contour Information
+
Merging the Physical Layers on Top of each other
Physical AM Part

Fig. 1 Additive Manufacturing process steps

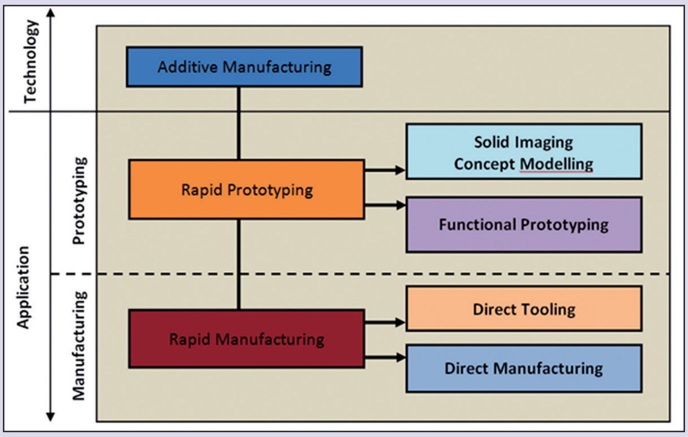


Fig. 2 Application levels of Additive Manufacturing

Key Features and Advantages of Additive Manufacturing

Additive Manufacturing has found its way into many end-use production applications. In these cases, AM has proven itself to have advantages over conventional manufacturing processes. Some of the key features of AM are as follows:

- AM enables the usage of complex geometry in achieving design goals without incurring time or cost penalties compared to simple geometry; this allows designers to avoid most manufacturing process constraints.
- AM enables the usage of customized geometry and parts by direct production from 3D data.
- With AM, it is often possible to consolidate parts, integrating features into more complex parts and avoiding assembly issues.
- Direct fabrication from digital data and the avoidance of hard tooling enable low production volumes to be economical, in many cases.

AM offfers following advantages over conventional manufacturing.

- Reduction of tooling
- Reduction in inventory
- Decentralized manufacturing
- Part consolidation
- Light weight parts
- Lattice structures
- Complete design freedom - Design For Function
- Easy to produce complex designs
- Entire Assemblies / Part Count Reduction
- Fewer Machine Operatiions / Office like Plants
- Little / no penalty for design change
- Easy reproduction capability

The Processes

The AM processes are broadly classified based on the materials i.e. thermoplastics or metals. The processes used for thermoplastics are listed in Table 1 and processes for metals are listed in Table 2.

Table 1: AM Processes for Thermoplastics

Stereolithography (SLA)

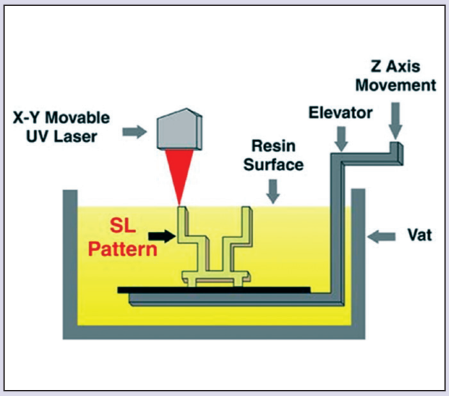
The raw material for SLA is a photosensitive liquid polymer which is filled in a basin. Apart from the raw material, the basin also includes a platform that can be moved in z-direction. In its initial position, the platform is located closely below the surface of the material. A UV-laser traces the cross-section of the part, causing the first slice of the resin to solidify in the respective area. Subsequently, the platform is lowered into the resin vat by the thickness of one layer (~ 5 µm). A sweeper blade applies new film of resin on top of the previously cured slice that is subsequently cured by the UV-laser again. This process is repeated and the following layer is fused to the solidified slice.

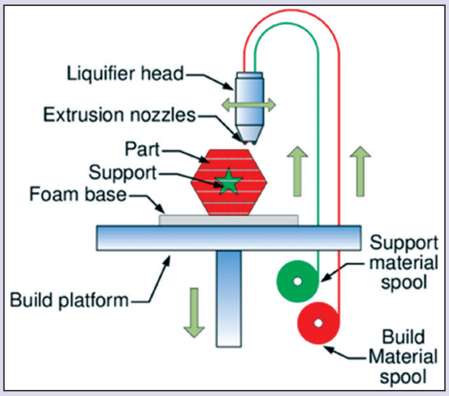
Fused Deposition Modeling (FDM)

The FDM process uses wire-shaped thermoplastics furled on cartridges when delivered. In the machine, the material is partly melted and extruded in the nozzle. The material is applied to the building board directly from 3D-CAD data. The nozzle moves in x- and y-direction; the building board moves in z-direction. Due to thermal fusion, the material bonds with the layer beneath. As the material hardens very fast, the complete model requires no further hardening. FDM needs a support structure for forming a base; especially for complex models with overhangs.

Laser Sintering (SLS)

SLS machines lay down a thin layer of plastic powder. With a laser, the powder is heated up to fuse the powder with previous layers. Due to intensity of the laser, the powder particles liquefy to state of melt and then solidify in a new shape. LS processes, in turn, bake the particles together by only fusing powder particles in their "solid state, at between one half of the absolute melting temperature and the melting temperature, but without melting the particles. After the laser has finished tracing one cross-section of the model, a new load of powder is applied on top and the process repeats.





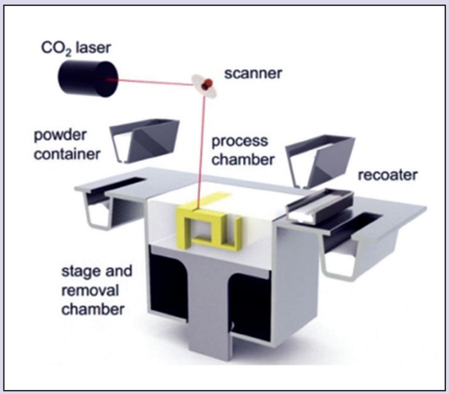
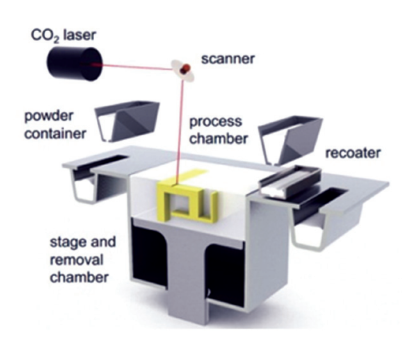


Table 2:AM Processes for Metals

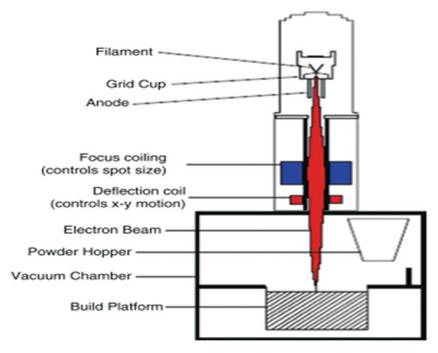
Selective Laser Melting (SLM)

SLM uses fine metal powders to build a part layer by layer. The process is executed under a closed atmosphere of shielding gas in order to achieve maximum part quality. First, a layer of powder is placed on the building platform. The laser traces the cross section of the part, thereby fluidizing and melting the respective particles (> melting temperature) together. The remaining powder serves as additional support structures. Upon completion of one cross-section, the platform is lowered by the height of one layer and another load of raw material is placed upon the existing model.



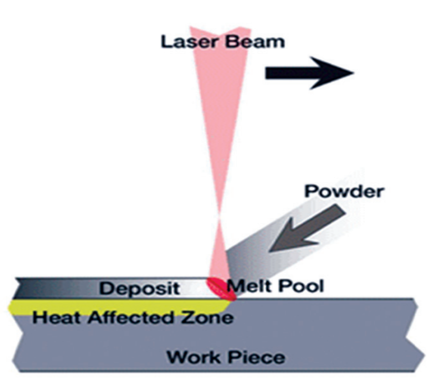
ElectronBeam Melting (EBM)

Electron beam melting (EBM) is an innovative additive manufacturing process in which metal powder or filament is completely melted by a concentrated beam of electrons. Production in a vacuum chamber ensures that oxidation will not compromise highly reactive materials like titanium. Vacuum production is also required so electrons don't collide with gas molecules. The building table goes down 1 mm at a time to provide the sequential layer requirement to finish the build component originally designed.



Laser Metal Deposition (LMD)

Metal powder is injected from feeder tubes into the focal point of a high-powered laser and the material is basically welded into place atop the previous layer. To prevent oxidation, an inert gas is flown as a shield around the melt pool. The material is deposited first as a perimeter of the current cross section, then a raster fill pattern is used to make the solid areas. In contrast to powder bed methods, a real 3D deposition strategy may be employed, objects being built by depositing a continuous track of material that develops in the three-dimensional space according to an appropriate tool path, the newly deposited material finding support in the previously deposited one.



ISAC: Keeping abreast with the latest technology

Space industry is one of the few wherein usage of additive manufacturing is justifiable. Broadly ISAC can use additive manufacturing in following domains.

1. Prototype generation specifically for TDP demonstration.
2. Scaled down component generation for concept demonstration.
3. Generation of end use components for mass savings.
4. Generation of end use components to near net shape which are complex by design and very difficult to be produced by conventional manufacturing.

Thermoplastic parts are being produced in-house, whereas the metallic parts are sourced from service bureaus. Some hardware realized through AM at ISAC are shown in Figure 3

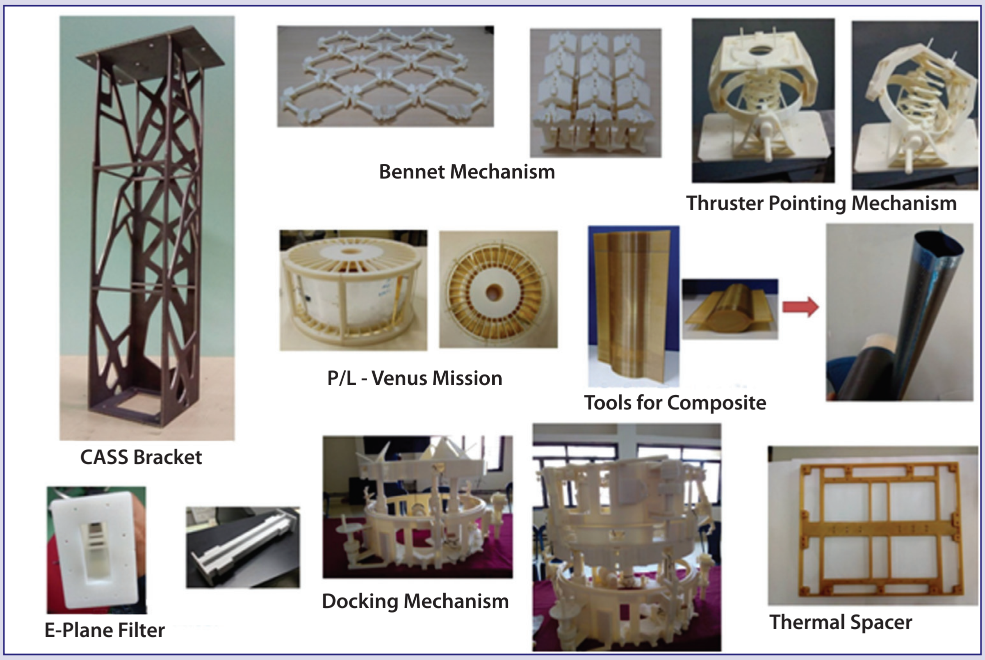


Fig. 3 Hardware realized through AM

AM and Optimization

Additive Manufacturing has come out advantageously for aerospace and space industry in last few years. Many lightweight designs which were ruled out earlier due to manufacturing limitations now have become realizable with advent of additive manufacturing. A long era has passed wherein all the designs were done to suit conventional manufacturing process and today most of the designs available are meant for conventional manufacturing. There is no second thought about advantages of additive manufacturing but they are coming at much higher cost. As a general rule, if a part can be fabricated economically using a conventional manufacturing process, that part should probably not be produced using AM. In order to tap the best potential of AM, it is strongly recommended to design the part for AM. The existing designs should be optimized for mass reduction or parts consolidation can be experimented in many assemblies. One such optimization study was done on a Coarse Analog Sun Sensor (CASS) bracket. The complete optimization cycle is shown in Figure 4. A lightweight design with 25% reduced mass and improved performance was achieved in the process.

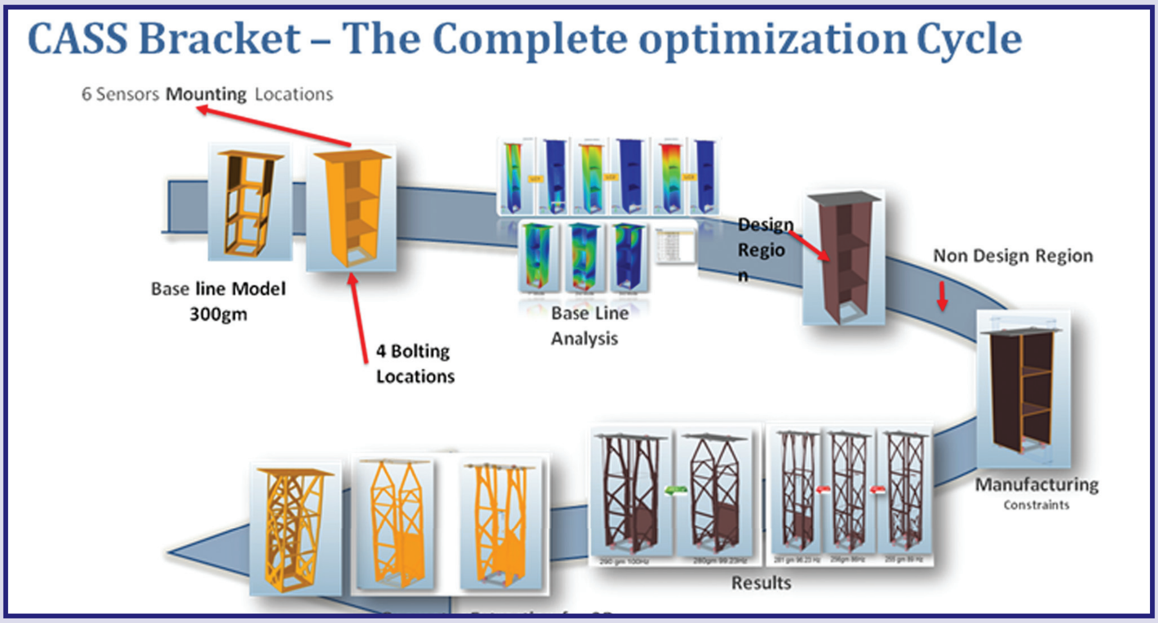

CASS Bracket – The Complete optimization Cycle
6 Sensors Mounting Locations
Base line Model 300gm
4 Bolting Locations
Base Line Analysis
Design Regio n
Non Design Region
Manufacturing Constraints
Results

Fig. 4 Optimization of CASS Bracket

For further reading:

1. Andreas Gebhardt. Understanding AdditiveManufacturing. Hanser Publication, 2011.
2. ASTM Committee F42 on Additive Manufacturing Technologies. http://www.astm.org/COMMITTEE /F42.htm
3. David W Rosen, what are principles for design for additive manufacturing?, School of Mechanical Engineering, Georgia Institute of Technology, 813 Ferst Drive Atlanta, GA 30332-0405, USA, 26-28 May 2014, Singapore.

Saurabh Gupta
Dy. Manager, DTDF, Facilities

COMPREHENSIVE HEALTH CHECKUP FOR DOS/ISRO EMPLOYEES

Report by: Gautami Sudarsan
SR. ADMN. OFFICER

- **Conducted from 28/12/2017 to 02/02/2018.**
- **To profile the risk of the employees to customized strategies for the health and well-being of complete Organization**
- **Medical checkup carried out for 1619 employees (over 40 years).**
- **The Blood Pressure and Diabetes profile of over 70% employees are in safe condition in all the age group across genders.**
- **Thyroid profile values show that high proportion of employees (male and female) fall in normal category.**
- **Overall health condition of DOS/ISRO employees is "Good".**

उपग्रह अभिकल्पना से प्रमोचन तक

कौंधा एक विचार, मानव के मन में
करे सुदूर संचार, सितारों के तोरण से
माँ धरती को देख सके, दूर अंतरिक्ष गहन से
जन मानस को बचा सके, विरल आपदा प्रबंधन से।

हुआ शुभारम्भ, वास्तविक बने विचार
संजोया उपग्रह अभिन्यास, निर्णायक बने नीतभार
किये अध्ययन संरचना पर, हुये विश्लेषण बारम्बार
उपतंत्रो की अभिकल्पना और सॉफ्टवेअर की संरचना
उपतंत्रों का हुआ सृजन, हुए परीक्षण अगणित और गहन।

मस्तिष्क में संकेतों का आवागमन,
बिछा हुआ है तंत्र जाल,
ऐसे ही तार तंतु का किया एक नव निर्माण।
जुड़े उपतंत्रो से उपतंत्र, हुआ संकेतों का आदान-प्रदान
तार तंत्र का सरस सरल स्वभाव, पर फिर भी
वाह्य अवांछित संकेतों से अभेदित,
करे निर्धारित ऊर्जा का स्राव।
नींव उपग्रह की रखी उपकरणों के पैनल पर,
रीढ़ सा सहारा बना, अपरूपण पैनल और केन्द्रीय सिलिंडर।

किए समाकलन सब उपतत्रों के
ऊर्जा, दूरसंदेश, दुरमिति, नियंत्रक
प्रेषित्र, अभिग्राही, नीतभार और संवेदक।
हुआ प्रेम प्रलाप सब उपतंत्रों में,
समीपति समीप्य अभितंत्रों में भी
हुआ न किंचित कार्य विचलन।

नन्हें जीव की हृद धड़कन सी
थिरक उठा, मेरा मन भी
संतोष के कुछ भाव उठे,
थोड़े से अभिमान जनक,
सम्पूर्ण समाकलित उपग्रह के परीक्षणोपरान्त गहन।

सौर पैनलों और श्रृंगिकाओं का भी हुआ संकलन
मैं मदमाता और मुस्कुराता देख अपनी चितवन।
चहुं ओर रंगा सुनहरे और चांदनी वस्त्र से वातावरण।

एक तरफ थी प्रसन्नता और कंपन भीतर मन में
अब जाना होगा मुझे ताप निर्वात कक्ष में।
छोड़ दिया सब मित्रों ने अकेले ही मुझे,
ठंड शीत की जकड़न और जेठ से ज्यादा तपन में
कृतार्थ हूं मैं ऊष्मीय प्रणाली का,
जिन्होंने रखा जीवित मुझे ताप निर्वात नियंत्रण से।

हुई समाप्ति अग्नि परीक्षा की ओर
झंझावात सा आया, अरे यह क्या
मैंने स्वयं को कंपन अभियंत्र पर पाया।
सकुशल पार कर गया मैं इन सबको,
खुशी का मौसम आया।
ताल मृदंग और स्वरों से भी
स्वयं को परखवाया।

कठिन परीक्षणों से होता हुआ उत्तीर्ण
अब गंतव्य की राहें हो चली थीं संकीर्ण।
प्रसन्नता की लहर थी, उपलब्धियों का गर्व था,

मेरे निर्माता।
मैं प्रमोचन मंच पर अभी भी,
जुड़ा हुआ या संवेदनशील नाभीय से
एक झटके में मैं उड़ चला गंतव्य की ओर
और अब तो, प्रमोचन यान ने भी साथ दिया था छोड़।
लैम का संक्रियात्मक ज्वलन,
और निर्धारित कक्षा में हुआ स्थापन।

पर मेरे निर्माता,
आप मेरी मनः स्थिति से अनभिज्ञ,
मैं कक्षा में निरत संघर्ष में रत
प्लाज्मा की कठोर आँधियों में,
पृष्ठ आवेश के न्यूनीकरण में,
गामा तरंगों के विकिरण अवशोषण में
हत आहत होता हूं मैं।

पर मेरे निर्माता,
आपने बनाया मुझे इतना शक्तिमान
ताम्रटेपों के कुंडल और परिरक्षक कवच कर्ण समान,
कर दूं अचम्भित जनमानस की सेवा
कर,
निर्धारित आयुतक, निर्विघ्न और
निरंतर।

अंजू दामोदरन
वैज्ञानिक / अभियंता एस एफ
विद्युत समाकलन विभाग - 2
तंत्र सभाकलन समूह

Thus Spoke our few Young Engineers - SC

Krishnan Nampoothiri M
GEOSAT PROGRAMME

Does your perception on Indian Space Research Organization (ISRO) remain the same as it was before joining ISRO?

No. Before joining this Organization, my perception about ISRO was full of Rocketry. After joining, I came to know that there are more things being carried out in ISRO towards satellites area and there by influencing the common man's life, the tremendous technologies developed at ISAC and other ISRO Centres, the vast scope for contributing to the nation through ISRO & so on.

Aditya Agarwal
STRUCTURES GROUP

How do you see ISRO Satellite Centre 10 years from now? Why?

ISRO Satellite Centre is going to be a fully busy Centre in upcoming years. ISRO as an Organization is aiming for more launches in the coming years; this Centre is working on a plethora of satellites. I like to appreciate the ISAC Management about their "dooradrushti" (foresight) and consequently their decision to go for private vendor concept which will help the Organisation to concentrate more on R & D activities.

Aman Gupta
STRUCTURES GROUP

How do you see yourself in ISRO Satellite Centre 10 years from now? Why?

I see myself working on space technologies trying to muster information about life beyond Earth, on missions focused on understanding other planets' atmosphere and origin together with manned missions to other celestial bodies in addition to continuing with the applications of space science & technology for meeting country's needs.

Priyanshu Kumar
RELIABILITY & QUALITY AREA

Which area do you think ISAC should give more thrust to? Why?

Some of the areas in which ISAC needs to give more thrust, can be in the newer technology areas like nanotechnology which can be used for the newer designs since it has many advantages. Also electric propulsion will be a hot area for research as providing higher thrust by electric propulsion will eventually increase the payload mass. In power electronics also ISAC can work on 100V application bus which is the present trend elsewhere too. I am aware that these have already been initiated.

Netra S Pillai
SPACE ASTRONOMY GROUP

From your perspective, what makes you feel proud of ISRO?

ISRO making rapid technological advancements is what makes me proud. And added to that, making the benefits of these technologies reach the common man is the best achievement.

Nirupam Sharma
Reliability & Quality Area

The ever increasing achievements of ISRO, the scope, opportunity and liberty to present ideas, the work culture and dedication of fellow colleagues, amicable environment and the respect which people have for an ISRO scientist are the things that make me proud to work in ISRO.

Upagrah posed these questions to many young engineers of ISAC. The response was overwhelming. It is heartening to hear from all these young engineers that ISRO's contribution in enhancing the quality of life of common man is tremendous, thus they have high appreciation and are proud to be a part of Team-ISRO. Here's a random sample from our young engineers.

EVENTS & VISITS

Visit of Chairman ISRO to ISITE

Inauguration of Storage Facility at ISITE by Chairman

Visit of Portugal Delegation to ISITE

New Year Celebrations 2018

Seminar to commemorate 250 successive successful on-orbit deployment of spacecraft mechanism

Refreshers Training Programme

Visit of German Delegation to ISITE

Talk on Model checking & system Verification

Swatchhta Pakhwada Activities

User awareness on web of Science

Swatchhta Pakhwada Activities

Swatchhta Pakhwada Activities

Visit of Dignitaries

Visit of NIAS Delegation

Visit of DOT Officials

Visit of his holiness Sri Sri Ravi shankar

Visit of Dr. K Sivan, Chairman,ISRO to ISAC

New Year Celebrations 2018

Visit of department related Parliamentary Standing Committee

Visit of IDAS Officers

Visit of UN Diplomats to ISITE

EVENTS & VISITS

CAMSA 2018

Visit of Azercosmos Delegation at ISITE

Visit of IB Team

Familiarisation Programme

Financial management awareness workshop by SBI

Visit of French Delegation to ISITE

Visit of CSSTEAP to ISITE

Inauguration of New MEDF Lab

HRDD Familiarisation Programme for Engineer SC

HRDD Training Prog Metamorphisis

Stress management seminar

Science Promotion

Visit of Netherlands Team

Visit of IRS

AIT Vendor Training Programme Mechanical and Electrical

Visit of NASA Team

Visit of NIAS Team

Visit of European Delegation Team to ISITE

Basic Fire Fighting Training for Cisf Personnel by Isac Fire & Safety

Seminar Lecture- Ravi Margasahayam

Visit of AS to ISITE

Visit of High level Delegation from Bhutan

INTERNATIONAL WOMEN'S DAY - 2018

Hand in hand we strive; Limitless avenues await. . . .

So ran the theme for Women's Day this year at ISAC. Our Organisation has always stressed upon equal opportunities without gender differences and over the years the number of women in decision making positions has risen. IWD 2018 Chairperson, Miss Suma D R was particular while planning the programme that we celebrate the women in ISAC as empowered and playing important roles in the organization.

A sports day for women was held on 22nd February 2018 at ISITE which was a roaring success with enthusiastic participation from over 200 women employees. There was a walk followed by competitions: aiming a ball into a bucket, throwing a ring over a pole and musical chair.

TDS/ISAC

The main programme was held on 8th March 2018. Dr Mallika Sarabhai and Smt. Sangeetha Srikishen adorned the stage as guests. The program began with a short documentary "ISAC women in action" by the Audio-Visual Facility (AVF) team. The inaugural programme included address by Director Dr M. Annadurai, Controller Dr A K Sharma, IWD Chairperson Smt Suma D R and a keynote address by the Chief Guest Dr Mallika Sarabhai who spoke about the need for women to first believe in their strength and bring a change from within. She also fondly remembered her late father Dr Vikarm Sarabhai and mother Mrinalini Sarabhai and how they inculcated confidence and good values. Smt Sangeetha Srikishen showed us her journey towards setting up SMILE (Support Matters In Life Everyday) charitable trust for the good cause of building toilets in schools. On a request from the audience she sang a kannada folk song to which the audience enthusiastically sang along.

We also honoured a woman employee each from BBMP, BMTC and BMRTC for their outstanding services to the public.

The cultural programme in the afternoon '**VARNA**' was colourful true to the title with a variety of folk dances from various states. There were skits and a stand up comedy and music that brought out hidden artistic talents of ISAC employees.

An exhibition was set up outside the auditorium where women employees displayed their skills technical as well as non-technical. Aesthetically designed and filled with art and handicrafts the festive mood was apparent.

The IWD committee also brought out a souvenir with several articles by ISACians which was quite an enjoyable read.

The IWD 2018 celebration at ISAC was truly memorable and along with that left us with the spirit of team work, new friendships, small acts of affection, problem solving skills and the pure joy of being a woman!

Report by: Shyama Narendranath K C
Member Secretary, IWD

REPUBLIC DAY CELEBRATION AT ISAC

TDS-ISAC

TDS-ISAC

NATIONAL SCIENCE DAY-2018

`National Science Day' is celebrated all over India on 28th February every year with great passion and enthusiasm to inculcate a scientific spirit in the young minds and kindle their curiousity towards scientific reasoning from a very young age. This day is celebrated in commemoration of the discovery of Raman Effect by the Indian Physicist Sir C.V. Raman in the year 1928, which fetched him the prestigious Nobel prize in Physics in the year 1930. We at ISRO Satellite Centre, celebrate the National Science Day, every year, by encouraging students and teachers from various schools in and around Bangalore to participate in various events that the Centre conducts, related to the NSD-theme. *"Science and Technology for sustainable future"* was the theme this year.

The events for the students saw a very wide participation of about 1000 students from over 100 schools from various parts of Bangalore. On the 17th Feb 2018, "Essay Competition" and "Test of Scientific Temper" were held. Essay Competition attracted about 150 students from 30+ schools. Excellent essays on two topics *"Solar energy for sustainable future"* and *"Electric vehicles for a sustainable future: Bane or Boon"* made the evaluation tough. The event "Test of Scientific Temper" with various inquisitive questions to think through and bring out scientific reasoning kept all the participating students engrossed into the depths of science for about 90 minutes. On 24th of Feb 2018, there were three events: The Teachers Event, Innovative Ideas and Extempore Science Elocution. The Teachers Event had about 15 selected presentations where the teachers spoke about Science and Technology for sustainable future. The event "Innovative Ideas" attracted a good number of participants with about 30 students presenting very innovative and thought provoking ideas on two topics. The event "Extempore Science Elocution" also had a overwhelming participation from about 70 students talking on topics related to the theme of NSD-2018.

TDS/ISAC

TDS/ISAC

NSD celebrations at ISAC on the 28th Feb 2018 was inaugurated by Director, ISAC with lighting of the lamp. There were two exhibits, Mobile science exhibition and Mobile Planetarium for the students. In the forenoon, there were three other competitions: Science Quiz, Spot Painting and Science in Action. While the Science Quiz tested the depth of scientific knowledge of the young minds, the Science in Action made them realize the level of understanding of the fundamentals of science in them. Spot Painting brought the artists in the young and energetic students, which amazed us with all its glory.

The valedictory function was in the afternoon of the same day. Dr. M. Annadurai, Director ISAC presided over the function. A melodious invocation song was rendered by Ms. Ankita Pramanik , a student of K.V., NAL. Dr. Anil Agarwal, Chairman, NSD-2018 welcomed the gathering and gave a brief address. A short presentation was made on the glimpses of science and its applications at ISAC, by Ms. Rahamathunissa, G from SNG, ISAC and Dr. Sankarsubramaniam from SAG, ISAC. Dr. M. C. Ramadevi, Member Secretary, NSD-2018, presented the report of NSD-2018. The Presidential address was delivered by Dr. M. Annadurai, Director, ISAC. His speech was very interactive and kept all the students engaged throughout. The motivational and inspirational NSD-lecture was delivered by the Chief Guest Dr. B. S. Shylaja, Former Director of the Jawaharlal Nehru Planetarium on a very interesting topic *"Binary Stars and Gravitational Waves".* The prize winners of various events in NSD-2018 were awarded the prizes by the dignitaries on the dais. NSD-2018 glitz which gives a glimpse of the NSD celebrations at ISAC, was released by the dignitaries. The vote of thanks was proposed by Mr. Jayasimha, one of the conveners of NSD-2018. National Science Day at ISAC which was very well organized by the Conveners and Members of the organizing committee of NSD-2018, had a overwhelming response from various schools in and around Bangalore.

Report by: Ramadevi M C
Member Secretary, NSD

SWACCH BHARATH MISSION AT GOVT. PRIMARY SCHOOL, BELLUR, KOLAR DISTRICT

On 31st January 2018, a small but vibrant Swacch Bharath team comprising of Dr.Nagendra, Dr.Girish, Shri Chandra Babu, Shri Revanna, Shri TM Nagaraja and Smt.Lalitha visited the Govt.Primary school at Bellur in Kolar district. This school had a strength of 250 children, many of whom were well versed with yoga. This came as no surprise, when we learnt that the renowned yoga guru BKS Iyengar hailed from this illustrious town and hence, yoga was a part of the school's daily routine.

Soon after the school assembly and after the initial pleasantries, Shri Chandra Babu, introduced the children to the Swacch Bharath initiative and outlined the day's program. Dr.Nagendra then spoke to them in depth about the measures we could adopt to realize a "Clean India". Shri Nagaraja covered aspects of personal hygiene and emphasized its importance in daily life. Having provided food for thought, children were asked to write an essay on the topic *"My contribution in making my village cleaner".* Younger students from stds 1-4 were asked to put down their ideas in the form of drawings. Besides providing the children with stationery such as crayons, pens, paper, pencils and erasers, they were also given a few chocolate éclairs each, as a reward for participating. The children were given an hour's time to finish, after which teachers evaluated their work and listed out the prize winners.

While the teachers were busy with evaluation, the children were made to clean the campus by picking up litter and scraps of paper and putting them into the new dustbin that we had presented to the school. Next, children planted saplings that the team had brought from ISAC, which taught them the importance of having green and clean surroundings. The practical session ended with a live demonstration on compost making from soil, dried leaves and kitchen waste by Shri Chandra Babu, reinforcing in the students the idea of returning to the soil, the nutrients it had once so generously given to grow plants and trees.

Once these activities had ended, the children were reassembled. As part of the science outreach venture, Shri Revanna explained in simple terms and with models, the basics of rockets and satellites. Dr.Girish continued the science session by explaining how eclipses occur and encouraged children not to believe in the various myths and superstitions associated with them. Dr.Nagendra closed the session by a simple but exciting science quiz. Prizes were then distributed to the prize winners amongst a lot of clapping and cheering. We also gave away surprise gifts to children from every class who were neatly dressed and looking tidy. During the vote of thanks, the children were reminded, that if they worked hard, the sky was not the limit. On this note, the team returned confident that both the saplings as well as the Swacch Bharath ideas that had been planted, would bear rich fruit in the years to come.

Report by: **Lalitha Abraham M A**
Section Head, SAG

NATIONAL SAFETY DAY

National Safety Day is observed through out the country on 4thMarch every year to create awareness and inculcate the habit of safety among employees by preparing them through periodic and timely sensitization about safety. Safety Fortnight Celebrations at ISAC starting from 4th March 2018 is an effort in this direction. As part of this, various activities were carried out. Following competitions were held for both employees and contract personnel for which there was good response.

- Poster Making with theme of *"Impact of human behaviour on safety in work place",*
- Safety Slogan with Theme of *"Accident reporting, a tool for accident prevention",* in Kannada, English and Hindi,
- Essay writing with Theme of *"Positive behaviour at work place for safety & health"* in Kannada, English and Hindi,
- Safety Quiz,
- Pick and Speak on various safety related topics.

To create awareness, to prepare the employees for emergencies, and, to demonstrate the fire fighting and rescue abilities of ISAC safety, a mock fire evacuation drill of the Admin & Library block was carried out on 21st March 2018. Various techniques of evacuation of casualties by Fire Fighters and Medical Personnel were demonstrated. Different fire extinguishing techniques were also demonstrated while providing hands on experience to some of the spectators present.All the employees from Admin and Library block participated earnestly.

The valedictory function of the Safety Fortnight was conducted on 23rd March 2018 with talk on *"Some Perspectives in Industrial Safety"* by chief guest Shri V K Srivatsava, formerly GM, Mission Planning & Range Safety at SDSC, SHAR. The function was presided by Dr M Nageswara Rao, Associate Director, Dr A K Sharma, DD, MSA and G N V Prasad, DD, MISA.

Report by: **Ramesh Naidu V**
Chairman, Organizing Committee,National Safety Day Celebrations – 2018

Upagrah Congratulates ISRO Team Awardees

Upagrah Congratulates 25 Years of Glorious Service Awardees

"इसरो में 25 साल की उत्कृष्ट सेवा यशस्वी रूप से पूर्ण करने पर सम्मान समारोह"

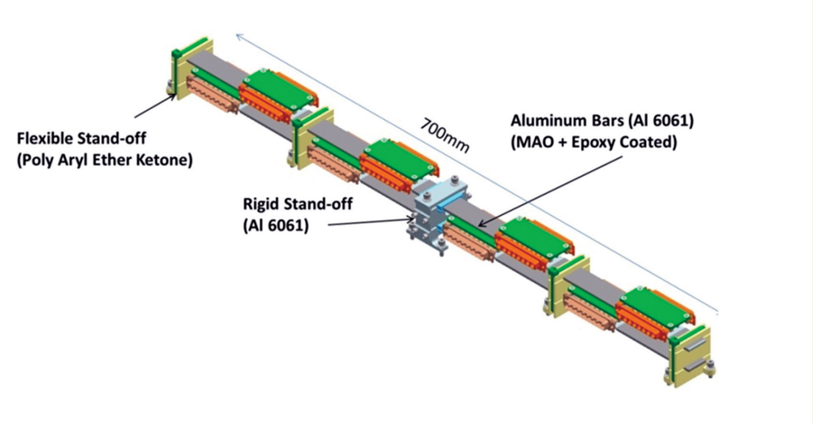
Upagrah Congratulates **CISF-L/ CT SHASHIKALA, B C** *who had won* **GOLD MEDAL** *in 400 Mtr. Relay race & Bronze Medal in Javelin Throw in National Masters Athletic Championship-2018 which was held at Kanteerava Stadium Bangalore during 21st -25th Feb 2018.*

ಬಸ್ ಬಾರು – ಏನು ಇದರ ಕಾರ್ಯಭಾರ?

ರಾಘವೇಂದ್ರ ಬಿ ಕುಲಕರ್ಣಿ
ಎಸ್. ಎಸ್. ಕ್ಯು ಜಿ

ಮುರಳೀಧರ ಕೆ ವಿ
ಸಂರಚನಾ ವಿಭಾಗ

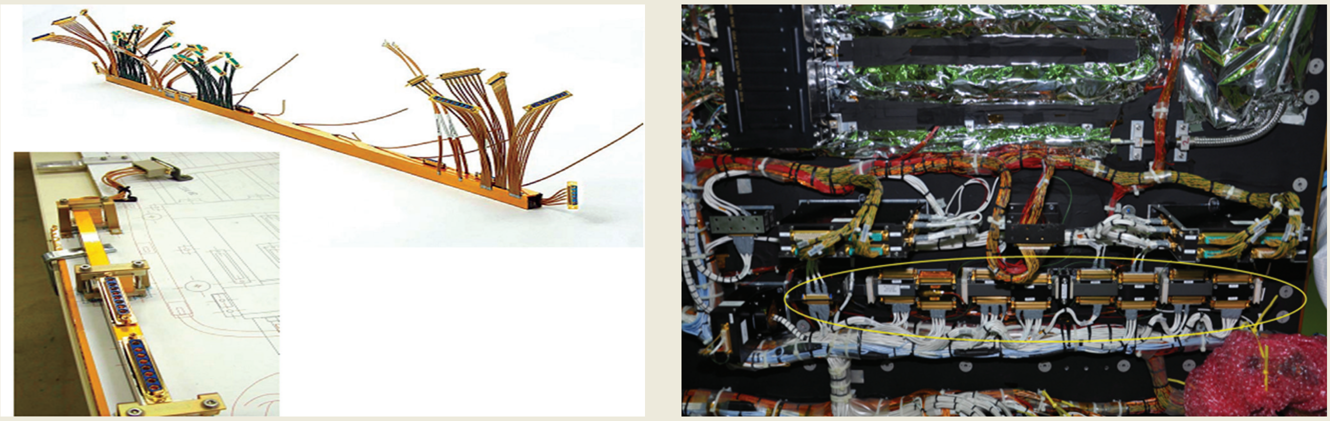
ಉಪಗ್ರಹದ ಸಮಗ್ರ ಕಾರ್ಯನಿರ್ವಹಣೆಗೆ ಅನೇಕ ಉಪವ್ಯವಸ್ಥೆಗಳ ಸಮಾಕಲನ ಅತ್ಯಗತ್ಯ. ಉಪಗ್ರಹದ ಜೀವನಾಡಿ ಎಂಬಂತೆ ಇರುವ ಉಪವ್ಯವಸ್ಥೆಯೇ ಶಕ್ತಿ ಅಥವಾ ವಿದ್ಯುಚ್ಛಕ್ತಿ ವ್ಯವಸ್ಥೆ. ನಮ್ಮ ದೇಹದ ನರಮಂಡಲಕ್ಕೆ ಇದನ್ನು ಹೋಲಿಸಬಹುದು. ಈ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ ಸಾಮಾನ್ಯವಾಗಿ ತಂತಿಗಳ ಜಾಲ ಉಪಗ್ರಹದ ಮೂಲೆ ಮೂಲೆಗೂ ವ್ಯಾಪಿಸಿರುತ್ತದೆ. ವಿದ್ಯುಚ್ಛಕ್ತಿ ಇಲ್ಲದೆ ಉಪಗ್ರಹ ಕಾರ್ಯನಿರ್ವಹಿಸಲು ಸಾಧ್ಯವೇ ಇಲ್ಲ. ಚಿಕ್ಕ ಉಪಗ್ರಹಕ್ಕೆ ಬಹಳ ಕಡಿಮೆ ವಿದ್ಯುಚ್ಛಕ್ತಿ ಸಾಕಾಗುತ್ತದೆ. ಆದರೆ, ಉಪಗ್ರಹದ ಗಾತ್ರ ಹೆಚ್ಚಿದಂತೆ ವಿದ್ಯುತ್‌ನ ಅವಶ್ಯಕತೆಯ ಪ್ರಮಾಣ ಗಣನೀಯವಾಗಿ ಹೆಚ್ಚುತ್ತದೆ. ಎಲ್ಲರಿಗೂ ತಿಳಿದಿರುವಂತೆ ಉಪಗ್ರಹದಲ್ಲಿ ಸಾಮಾನ್ಯವಾಗಿ ವಿದ್ಯುಚ್ಛಕ್ತಿಯನ್ನು ಸೌರಫಲಕಗಳ ಸಹಾಯದಿಂದ ಸೂರ್ಯನ ಕಿರಣಗಳನ್ನು ಬಳಸಿ ಉತ್ಪಾದಿಸಲಾಗುತ್ತದೆ. ಬ್ಯಾಟರಿಯ ಮೂಲಕ ಶಕ್ತಿ ಶೇಖರಣೆಯನ್ನೂ ಮಾಡಲಾಗುತ್ತಿದೆ. ಈ ವಿದ್ಯುಚ್ಛಕ್ತಿಯನ್ನು ವಿವಿಧ ವಿದ್ಯುತ್ ವಾಹಕ ತಂತಿಗಳ ಸಮೂಹದ (Harness bundle) ಮೂಲಕ ವಿತರಿಸಲಾಗುತ್ತದೆ. ಆದರೆ GSAT-11 ನಂತಹ ಬಹುದೊಡ್ಡ ಉಪಗ್ರಹದಲ್ಲಿ ವಿದ್ಯುತ್ ವಾಹಕ ತಂತಿಗಳನ್ನು ಬಳಸಿದರೆ ವಿದ್ಯುತ್ ನಷ್ಟದ ಪ್ರಮಾಣ ಹೆಚ್ಚುತ್ತದೆ. ಈ ನಷ್ಟವನ್ನು ಕಡಿಮೆ ಮಾಡಲು ನಾವು ಬಸ್ ಬಾರನ್ನು ಉಪಯೊಗಿಸಬೇಕು. ಸಾಮಾನ್ಯವಾಗಿ ಇದು ಆಯತಾಕೃತಿ–ಉದ್ದನೆಯ ಘನ ಪಟ್ಟಿಯ (ಸಾಲಿಡ್ ಬಾರ್) ರೂಪದಲ್ಲಿದ್ದು ಲೋಹದಿಂದ ತಯಾರಿಸಲಾಗುತ್ತದೆ. ವಿದ್ಯುತ್ ವಾಹಕ ತಂತಿಗಳಿಗೆ ಹೋಲಿಸಿದರೆ ಬಸ್ ಬಾರು ಹೆಚ್ಚು ಗಟ್ಟಿಮುಟ್ಟಾಗಿರುತ್ತದೆ.



ಬಸ್ ಬಾರ್‌ನ ರಚನೆ

ಬಸ್ ಬಾರನ್ನು ಉತ್ತಮ ವಿದ್ಯುತ್‌ವಾಹಕ ಲೋಹಗಳಾದ ತಾಮ್ರ, ಅಲ್ಯೂಮಿನಿಯಂನಿಂದ ತಯಾರಿಸುತ್ತಾರೆ. ಇದು ಅಲ್ಯೂಮಿನಿಯಂನ (Al-6061) ಘನ ಪಟ್ಟಿಯ ಸಲಾಕೆಯಾಗಿದ್ದು, ಮೇಲ್ಮೈಯಲ್ಲಿ ಬೆಳ್ಳಿಯ ಮಿಶ್ರಲೋಹದ ಲೇಪನ ಕೊಡಲಾಗುತ್ತದೆ. ಅದಲ್ಲದೆ, ಪಟ್ಟಿಯ ಹೊರಮೈಯಲ್ಲಿ ವಿವಿಧ ರಾಸಾಯನಿಕ ಲೇಪನ ಮಾಡಿ ನಿರ್ವಾತ ವಾತಾವರಣವನ್ನು ಸಮರ್ಪಕವಾಗಿ ಎದುರಿಸಲು ಬೇಕಾದ ರಕ್ಷಾಕವಚವನ್ನು ಕೊಡಲಾಗುತ್ತದೆ.

ಈ ಕೆಳಗಿನ ಚಿತ್ರಗಳಲ್ಲಿ ಬಸ್ ಬಾರಿನ ಅಳವಡಿಕೆಯನ್ನು ತೋರಿಸಲಾಗಿದೆ. ಬಸ್ ಬಾರಿನಿಂದ ವಿದ್ಯುನ್ಮಾನ ಉಪಕರಣಗಳಿಗೆ ವಿದ್ಯುತ್ತನ್ನು ಒದಗಿಸಲು ಸೂಕ್ತ ತಂತಿ ಮತ್ತು ಜೋಡಕಗಳನ್ನು ಬಳಸಲಾಗುತ್ತದೆ. ಈ ಮೂಲಕ ಬಸ್ ಬಾರು ವ್ಯವಸ್ಥೆ ವಿದ್ಯುತ್ ನಷ್ಟವನ್ನು ಕುಂಠಿತಗೊಳಿಸುತ್ತದೆ. ಬಸ್ ಬಾರು ಹೆಚ್ಚು ಬಿಸಿಯಾಗುವುದಿಲ್ಲ. ಸ್ಥಿರವಾದ, ಏರು ಪೇರಿಲ್ಲದ ವೋಲ್ಟೇಜನ್ನು ಒದಗಿಸುವಲ್ಲಿ ತುಂಬಾ ಸಹಾಯಕಾರಿ.

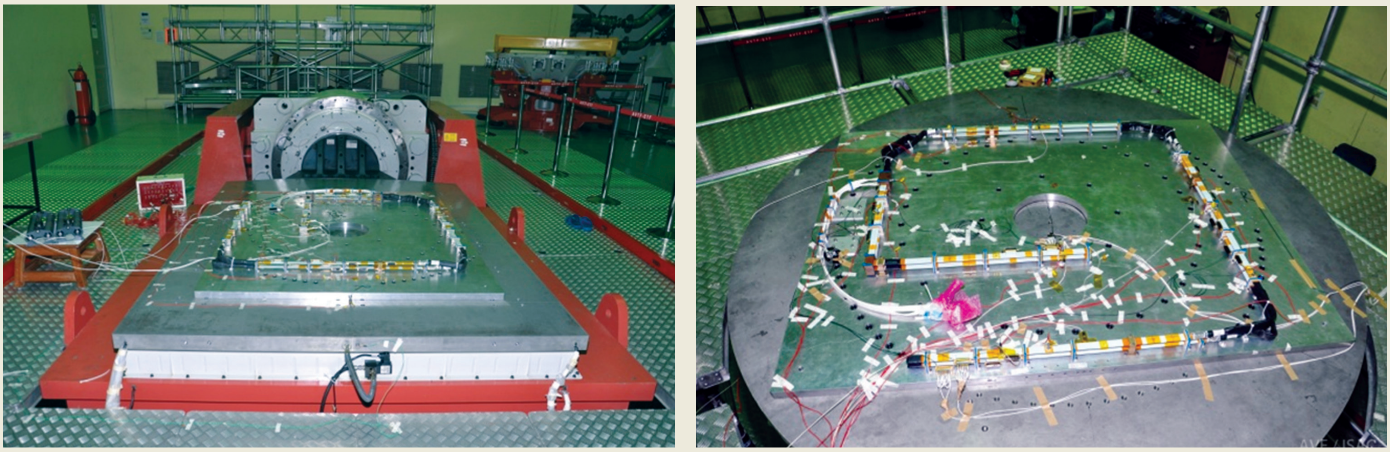


ಉಪಗ್ರಹದಲ್ಲಿ – ಬಸ್ ಬಾರು

ಬಾಹ್ಯಾಕಾಶದಲ್ಲಿ ಯಾವುದೇ ವ್ಯವಸ್ಥೆಯು ಕಾರ್ಯನಿರ್ವಹಿಸುವಾಗ ಕಠಿಣ ವಾತಾವರಣವನ್ನು ಎದುರಿಸಬೇಕಾಗುತ್ತದೆ. ಬಸ್ ಬಾರು ಇದಕ್ಕೆ ಹೊರತಲ್ಲ. ಹಾಗಾಗಿ, ಬಸ್ ಬಾರನ್ನು ವಿವಿಧ ಪರೀಕ್ಷೆಗಳಿಗೆ ಒಳಪಡಿಸಬೇಕಾಗುತ್ತದೆ. ಇದರಲ್ಲಿ ಮುಖ್ಯವಾದುದು ಕಂಪನ ಪರೀಕ್ಷೆ. ನಿರ್ವಾತೋಷ್ಣ ಹಾಗೂ ವಿದ್ಯುತ್ ವಹನ ಪರೀಕ್ಷೆ. ಈ ಪರೀಕ್ಷೆಗಳಲ್ಲಿ ಇದರ ಕಾರ್ಯಕ್ಷಮತೆ ತೃಪ್ತಿಕರ ಎಂದು ಸಾಬೀತಾದ ಮೇಲೆ ಉಪಗ್ರಹದಲ್ಲಿ ಬಳಸಲಾಗುತ್ತದೆ.

ಕಂಪನ ಪರೀಕ್ಷೆ

ಉಪಗ್ರಹ ಉಡಾವಣೆಯ ಸಮಯದಲ್ಲಿ ಎಲ್ಲಾ ಉಪಗ್ರಹದ ಉಪವ್ಯವಸ್ಥೆಗಳು ವಿವಿಧ ರೀತಿಯ ಕಂಪನಗಳಿಗೆ ಒಳಪಡುತ್ತದೆ. ಇದರಲ್ಲಿ ಬಸ್ ಬಾರೂ ಒಂದು. ಕಂಪನದಿಂದ ಉಂಟಾಗುವ ಎಲ್ಲ ಬಲಗಳನ್ನು ಸಮರ್ಪಕವಾಗಿ ಎದುರಿಸಿ ಬಳಿಕ ಕಕ್ಷೆಯಲ್ಲಿ ಅದರ ಕಾರ್ಯ ನಿರ್ವಹಿಸಬೇಕು. ಇದನ್ನು ಕಂಪನ ಪರೀಕ್ಷೆಯ ಮೂಲಕ ದೃಢಪಡಿಸಲಾಗುತ್ತದೆ. ಇದಕ್ಕಾಗಿ ಬಸ್ ಬಾರನ್ನು ದೃಢವಾದ ಅಲ್ಯೂಮಿನಿಯಂ ಫಲಕದ ಮೇಲೆ ಜೋಡಿಸಿ ಅದನ್ನು ಗತಿ ಕಂಪಕದ (dynamic shaker) ಸಹಾಯದಿಂದ ಕಂಪನ ಪರೀಕ್ಷೆಗೆ ಒಳಪಡಿಸಲಾಗುತ್ತದೆ. ತದನಂತರ ವಿದ್ಯುತ್ ವಹನ ಸಮರ್ಪಕವಾಗಿದೆಯೇ ಎಂದು ಶ್ರುತಪಡಿಸಲು ಪರೀಕ್ಷೆಗಳನ್ನು ಮಾಡಲಾಗುತ್ತದೆ. ತದನಂತರ ವಿದ್ಯುತ್ ವಹನ ಸಮರ್ಪಕವಾಗಿದೆಯೇ ಎಂದು ಶ್ರುತಪಡಿಸಲು ಪರೀಕ್ಷೆಗಳನ್ನು ಮಾಡಲಾಗುತ್ತದೆ.



ಕಂಪನ ಪರೀಕ್ಷೆಗಾಗಿ ಅಳವಡಿಸಿದ ಬಸ್ ಬಾರು

ಬಸ್ ಬಾರು ಬಗ್ಗಿಸುವ ಪರೀಕ್ಷೆ

ಬಸ್ ಬಾರು ಬಹಳ ಉದ್ದ ಇರುವುದರಿಂದ ಕಂಪನದ ಸಮಯದಲ್ಲಿ ಇದು ಬಗ್ಗುತ್ತದೆ. ಹೀಗಾಗಿ ಬಸ್ ಬಾರನ್ನು ಬಗ್ಗಿಸುವ ಪರೀಕ್ಷೆಗೆ ಒಳಪಡಿಸಲಾಗುತ್ತದೆ. ಹೀಗೆ ಬಗ್ಗಿಸಿದ ಮೇಲೆ ಮತ್ತೊಮ್ಮೆ ವಿದ್ಯುತ್ ವಹನ ಪರೀಕ್ಷೆ ಮಾಡಿ ಅದರ ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ದೃಢೀಕರಿಸಲಾಗುತ್ತದೆ.

ಬಸ್ ಬಾರು ಬಗ್ಗಿಸುವ ಪರೀಕ್ಷೆ

ನಿರ್ವಾತೋಷ್ಣ ಪರೀಕ್ಷೆ

ಈಗಾಗಲೇ ಉಲ್ಲೇಖಿಸಿದಂತೆ, ಕಕ್ಷೆಯಲ್ಲಿ ಉಪಗ್ರಹವು ಬಹಳ ಕಷ್ಟಕರವಾದ ವಾತಾವರಣವನ್ನು ಎದುರಿಸುತ್ತದೆ. ಇದರಲ್ಲಿ ನಿರ್ವಾತೋಷ್ಣ ಬಹುಮುಖ್ಯವಾದುದು. ಇದನ್ನು ಪರೀಕ್ಷಿಸಲು ಅಗತ್ಯವಿರುವ ನಿರ್ವಾತೋಷ್ಣವನ್ನು ಕೊಠಡಿಯಲ್ಲಿ ಸೃಷ್ಟಿಸಿ, ವಿದ್ಯುತ್ ವಹನ ಗುಣಮಟ್ಟ ಪರೀಕ್ಷೆ ಮಾಡಿ, ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ಮತ್ತೊಮ್ಮೆ ದೃಢೀಕರಿಸಲಾಗುತ್ತದೆ.

ಸಂಕ್ಷಿಪ್ತವಾಗಿ ಹೇಳುವುದಾದರೆ, ಅಧಿಕ ಶಕ್ತಿಯ ಉಪಗ್ರಹಗಳಲ್ಲಿ ಬಸ್ ಬಾರ್ ವ್ಯವಸ್ಥೆಯು ಹೆಚ್ಚಿನ ಕ್ಷಮತೆಯ ವಿದ್ಯುತ್ ವಿತರಣೆಗೆ ಅನುಕೂಲಕಾರಿ. ಇದರಿಂದಾಗಿ ಅಧಿಕ ವಿದ್ಯುತ್ ನಷ್ಟವನ್ನು ತಡೆಗಟ್ಟಬಹುದು. ಅದಲ್ಲದೆ, ಉಷ್ಣತಾ ನಿಯಂತ್ರಣವೂ ಸುಲಭ. ಹಾಗಾಗಿ ಯಾವುದೇ ಏರುಪೇರಿಲ್ಲದ ಉತ್ತಮ ವಿದ್ಯುತ್ ವಿತರಣೆಗೆ ಬಸ್ ಬಾರ್ ಸೂಕ್ತ ಉಪಕರಣ.

Upagrah offers its deep condolences to the family members of **Shri. Keshava N S,**
Proj. Personal Secretary; Structures Group,
on his sad demise on 18.01.2018

When is Earth closest to Sun?
(a) summer or (b) winter

Popular belief is that since temperature is high in summer, Earth should be closer to the Sun in summer.

In fact, the Earth is Closest to Sun during winter, in the month of January (perihelion point, 146 million Kms) and farthest in July (aphelion point, 152 Million Kms).

तकनीकी/राजभाषा संगोष्ठी-2017-18

अंतरिक्ष विभाग के आदेशानुसार हमारे केन्द्र में वर्ष 2018 में दिनांक 16 फरवरी 2018 को तकनीकी/राजभाषा संगोष्ठी का आयोजन किया गया। इस वर्ष तकनीकी संगोष्ठी का विषय - "छोटे, लघु एवं नैनो उपग्रहों के द्वारा अन्वेषण एवं उनका उपयोग" तथा राजभाषा का विषय (दैनंदिन कार्यालयीन कार्य में हिन्दी कार्यान्वयन में आ रही बाधाएँ और उनका समाधान) था। समिति ने तकनीकी व राजभाषा से संबंधित क्रमश 10 व 21 लेखों का चयन किया।

सतीश धवन सभागृह में 16 फरवरी 2018 को प्रात: 9.30 बजे से उद्‌घाटन हुआ। उद्‌घाटन सत्र के दौरान श्रीमती नलिनी प्रकाश ने वंदना प्रस्तुत की। डॉ. वेंकटेश्वर शर्मा, अध्यक्ष, हिन्दी तकनीकी संगोष्ठी आयोजन समिति ने स्वागत भाषण दिया। मंच पर उपस्थित गणमान्यों द्वारा दीप प्रज्वलन किया गया, तदुपरांत केन्द्र के नियंत्रक डॉ. आनंद कुमार शर्मा ने सभा को संबोधित किया।

श्री जसविंदर सिंह खोरल, अध्यक्ष, संपादन समिति ने लेख संग्रह के बारे में संक्षिप्त भाषण दिया और निदेशक महोदय द्वारा लेख संग्रह और सी.डी का विमोचन किया गया। केन्द्र के निदेशक, डॉ एम अण्णादुरै ने इस कार्यक्रम की अध्यक्षता की।

प्रो (डॉ) टी आर भ्ट्ट, सलाहकार संसदीय कार्य मंत्रालय एवं सदस्य, संयुक्त हिंदी सलाहकार समिति इस समारोह के मुख्य अतिथि रहे। वे इसरो में विज्ञान व प्रोद्योगिकी के विकास एवं राजभाषा कार्यान्वयन की गतिविधियों से भी बहुत ही संतुष्ठ रहे और उन्होंने अपने भाषण में भी इस बारे में अपने विचार प्रस्तुत किए और इसी तरह हिंदी के प्रचार-प्रसार को जारी रखने की अपील की।

श्रीमती नंदिनी हरिनाथ, वैजानिक अभियंता ने अपने आमंत्रित अभिभाषण में छोटे एवं लघु उपग्रहों के बारे में पॉवर पाइंट प्रस्तुतीकरण दिया। श्री मनोहर एल वाणियर, प्रधान कार्मिक व सामान्य प्रशासन ने धन्यवाद ज्ञापन दिया।

उद्‌घाटन सत्र के उपरांत समानांतर रूप से तकनीकी व राजभाषा सत्र शुरू हुआ। तकनीकी सत्र में 05 वैज्ञानिकों ने प्रस्तुतीकरण प्रस्तुत किया। राजभाषा सत्र में 07 पदाधिकारियों ने प्रस्तुतीकरण दिया। इनमें से दोनों सत्रों के दो-दो प्रतिभागियों को उत्तम प्रस्तुतीकरण हेतु क्रमश: प्रथम एवं द्वितीय पुरस्कार दिया गया । अंत में समापन समारोह में मुख्य अतिथि द्वारा प्रमाण पत्र व पुरस्कार वितरण किया गया।

हिंदी कार्यशाला रियोर्ट:-

भारत सरकार, राजभाषा विभाग तथा संसदीय राजभाषा समिति के निदेशों के अनुसार, हिंदी के प्रगामी प्रयोग को बढ़ावा देने हेतु केन्द्र द्वारा हर तिमाही में अधिकारी/कर्मचारिया के लिए हिंदी कार्यशाला का आयोजन किया जाता है। इस संबंध में, इसरो उपग्रह केंद्र द्वारादिनांक 23.03.2018 को सहायक अभियंता एवं कनिष्ठ अभियंताओं के लिए हिंदी अनुभाग द्वारा एक हिंदी कार्यशाला का आयोजन किया गया था। सर्वप्रथम, श्रीमती. सीना राजेन्द्रन, वरिष्ठ हिंदी अधिकारी ने हिंदी अधिकारी, इसरो मुख्यालय एवं

प्रतिभागियों का स्वागत किया।तत्पश्चात् श्रीमती डीनू रानी, हिंदी अधिकारी, इसरो मुख्यालय ने सत्र का संचालन किया।कार्यशाला के दौरान उन्होंने राजभाषा के महत्व को बताते हुए राजभाषा की नीति, नियमों एवं अधिनियमों पर प्रकाश डाला और केंद्र में लागू विभिन्न प्रोत्साहन योजनाओं एवं प्रशिक्षण के बारे सभी प्रतिभागियों को अवगत कराया। साथ ही उन्होंने (दैनंदिन कार्य में हिंदी का प्रयोग) विषय पर व्यावहारिक रूप से प्रशिक्षणार्थियों को विस्तृत ज्ञानवर्धक जानकारी भी प्रदान की।

इस कार्यशाला में कुल 84 प्रतिभागियों ने भाग लिया। श्री मनोहर एल वाणियर, वरिष्ठ प्रधान, कार्मिक व सामान्य प्रशासन ने कार्यशाला के समापन समारोह की अध्यक्षता की। उन्होंने सभी प्रतिभागियों से अपील किया कि अपना दैनंदिन शासकीय कार्य हिंदी में करें और अपने सहकर्मियों के साथ हिंदी में वार्तालाप करें तथा आकस्मिक अवकाश, अर्जित अवकाश, चिकित्सा बिल, भविष्य निधि, अग्रिम आवेदन आदि मुद्रित प्रपत्रों को हिंदी में भरें। तदनंतर वरिष्ठ प्रधान, कार्मिक व सामान्य प्रशासन ने अपने कर-कमलों से सभी प्रतिभागियों को प्रमाण पत्र प्रदान किया और साथ ही उन्होंने हिंदी अनुभाग के सभी राजभाषा पदाधिकारियों को भी, कार्यशाला के सफल आयोजन के लिए बधाई दी।

कार्यशाला के अंत में श्रीमती गीता प्रसाद, हिंदी अधिकारी ने सभी का आभार प्रकट किया। जय हिंद

संयुक्त विश्व हिंदी दिवस समारोह

इसरो उपग्रह केन्द्र, बेंगलूरु में 10 जनवरी 2018 को नराकास (का.-01), बेंगलूरु के सदस्य कार्यालयों एवं आईज़ेक के लिए संयुक्त विश्व हिंदी दिवस का आयोजन किया गया।

कार्यक्रम का उद्घाटन समारोह 02.30 बजे को सतीश धवन सभागृह में आयोजित किया गया।

श्रीमती बी.एस. शांताबाई, मुख्य सचिव, कर्नाटक महिला हिंदी सेवा समिति, मुख्य अतिथि के रुप में उपस्थित रहीं। इस कार्यक्रम का आगाज़ श्री कामेश वरनवाल एवं सुश्री आकांक्षा ओझा की वंदना के साथ किया गया।

श्री मनोहर एल. वाणियर, वरिष्ठ प्रधान कार्मिक व सामान्य प्रशासन ने सभा में उपस्थित सभी आमंत्रितों एवं प्रतिभागियों का स्वागत करते हुए कहा कि राजभाषा हिंदी के प्रचार-प्रसार में नवंबर 2018 माह के दौरान नराकास (का.-1), के तत्वावधान में सदस्य कार्यालयों के लिए विभिन्न हिंदी प्रतियोगिताओं का आयोजन एवं प्रायोजन किया गया। भविष्य में भी हिंदी की क्रियाकलापों को इसी तरह बनाए रखने हेतु सभी सदस्य कार्यालयों से अनुरोध किया। तदनंतर श्रीमती सीना राजेंद्रन, वरिष्ठ हिंदी अधिकारी ने मुख्य अतिथि के जीवन वृत्त से सभी को परिचय कराया।

कार्यक्रम की मुख्य अतिथि श्रीमती बी.एस. शांताबाई ने अपने संबोधन में कहा कि यह बड़े ही गर्व की बात है कि इसरो जैसे वैज्ञानिक संगठन में हिंदी का कार्यान्वयन बड़े ही सुचारु रुप से किया जा रहा है। उन्होंने कहा कि उनके अपने अनुभव में उन्होंने हिंदी को स्वतंत्रता समय से लेकर आज की वर्तमान स्थितियों में पनपते देखा है। उत्तर भारत के मुकाबले दक्षिण भारत में हिंदी का प्रचार-प्रसार चिंतन का विषय है। इसे आसान तब बना पाएंगे जब सभी एकजुट होकर हिंदी के लिए काम करेंगे। हिंदी भाषा को मात्र उत्तर या दक्षिण की नहीं बल्कि इसे पूरे राष्ट्र की भाषा बनानी है और इसे राष्ट्र भाषा बनाने के लिए वह स्वयं कुछ भी करने के लिए सदैव तैयार हैं।

डॉ. आनंद कुमार शर्मा, नियंत्रक ने अध्यक्षीय भाषण में कहा कि केंद्र में इस प्रकार संयुक्त विश्व हिंदी दिवस का आयोजन बहुत ही खुशी की बात है। केंद्र के पदाधिकारी लगातार दिन-रात प्रमोचन से संबंधी कार्य में अत्यंत ही व्यस्त हैं। इतनी व्यस्तता के बावजूद भी वे हिंदी के कार्यक्रमों में भाग ले रहे हैं, जोकि सराहनीय है। केंद्र की गतिविधियों के साथ-साथ राजभाषा कार्यान्वयन का प्रचार-प्रसार भी करना आवश्यक है। उन्होंने सदस्य कार्यालयों से आए हुए प्रतिनिधियों के साथ-साथ सभी विजेताओं को बधाई दी और इसी प्रकार जारी रखने के लिए कहा।

इस अवसर पर नराकास (का.-1), के तत्वावधान में आयोजित संयुक्त हिंदी पखवाड़ा के विभिन्न प्रतियोगिताओं के विजेताओं को पुरस्कार वितरित किए गए तथा केंद्र में चलाई जा रही मासिक प्रतियोगिताएँ, शब्द ज्ञान परख योजना, दसवीं तथा बारहवीं कक्षा के विद्यार्थीं, अधिकारी / कर्मचारी / वाहन चालकों के लिए लागू प्रोत्साहन योजना के विजेतागण को नकद पुरस्कार/प्रमाण-पत्र वितरित किए गए।

श्रीमती गीता प्रसाद, हिन्दी अधिकारी, आईज़ेक व सदस्य सचिव, नराकास (का.-1), बेंगलूरु ने धन्यवाद ज्ञापन प्रस्तुत किया। उन्होंने निदेशक महोदय डॉ. एम. अण्णादुरै जी को कृतज्ञता प्रकट की, कहा कि बहुत ही कम समय में इस कार्यक्रम का आयोजन किया गया, जिसका पूरा श्रेय निदेशक महोदय को जाता है। उन्हीं के मार्गदर्शन में यह कार्यक्रम निर्बाध रुप से आयोजित किया जा सका।

श्री अविनाश एम., वैजानिक/अभियंता ने कार्यक्रम का मंच संचालन किया। अंत में आईज़ेक के स्टॉफ सदस्यों द्वारा रंगारंग सांस्कृतिक कार्यक्रम प्रस्तुत किया गया।

श्रीमती सीना राजेंद्रन
वरिष्ठ हिंदी अधिकारी -
द्वारा रिपोर्ट

ISRS –Bangalore Chapter

IRS-1A (30th year) Launch Commemoration Day function

Indian Society of Remote Sensing - Bangalore Chapter
CORDIALLY WELCOMES YOU
IRS-1A LAUNCH COMMEMORATION DAY
(30TH YE FUNCTION
19th March, 2018 y), 15.00 - 16.00 hrs
Dhawan Au atellite Centre, Bangalore

IRS-1A is the first operational Remote Sensing Satellite launched by ISRO on 17th March 1988. The satellite was successfully operational till 1996, a historical achievement by ISRO. The Indian Society of Remote Sensing (ISRS) Bangalore chapter celebrates the event every year by organizing special programmes.

This year a function was organized by ISRS-Bangalore chapter to commemorate the 30th year of launch of IRS 1A. The event was arranged at Satish Dhawan Auditorium, ISAC on 19th March 2018 . ISRS local chapter members and professionals from ISRO attended the function in large numbers. Shri S A Kannan, Secretary welcomed the gathering. In his opening remarks Shri G.Nagesh Vice-Chairman ISRS-Bangalore, described the path-breaking record of IRS-1A spacecraft and briefly traced the developments that have happened since then.

Dr M Annadurai Director, ISAC & Chairman, ISRS-Bangalore Chapter, delivered a highly interesting and informative talk on *'Remote Sensing Satellites – Past, Present & Future'.* It was very much appreciated by the audience. Dr Annadurai explained interesting facts on the evolution of Remote Sensing Satellite Technology in ISRO. He stressed the point that many more professionals working in different areas of Space Technology & Applications have to become members of ISRS leading to a synergy that would benefit the end users. The function came to a close with a vote of thanks

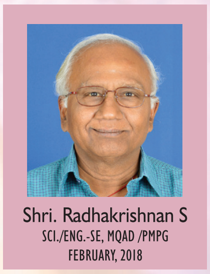
Report by: S A Kannan
Secretary

SUPERANNUATION

Upagrah Wishes them the Best...

Smt. Ravindra Bai
Junior Engineer, SEG
JANUARY, 2018

Shri. Vandakumar B
Purs. & Stores Officer, Purchase Cell-LEOS
JANUARY, 2018



Shri. Radhakrishnan S
SCI./ENG.-SE, MQAD /PMPG
FEBRUARY, 2018

Shri. Damodar Singh
Junior Engineer, DTFD/ FAC
MARCH, 2018

Smt. Radha S
Junior Engineer, CSG
MARCH, 2018

Shri. Madappa P U
SR.Tech.-A, C&MG
MARCH, 2018

Shri. Udaya Kumar M
Project L V D, Transport
MARCH, 2018

Shri. Virupakshappa B
SCI./ENG.-SG, C&MG
MARCH, 2018

Shri. Sadashivaiah A S
SR.TECH.-A, C&MG
MARCH, 2018

EDITORIAL BOARD

Shri. Hiriyanna, S (Chairperson) • Dr. Murugan, P (Alt. Chairperson)
• Shri. Muralidhar, K V • Shri. Vinod Kumar • Shri. Kartika Chandra Swain • Smt. Padma Vidhya
• Shri. Satyanarayana, G • Smt. Shyama Narendranath, K C • Shri. Kattimani, S M • Shri. Navaneetha Krishnan, S • Smt. Seena Rajendra
• Smt. Kantha, P / Smt. Anitha, B R (Member Secretary)

Photographs: ISAC Photo Laboratory Design: Imagic Creatives Pvt. Ltd, Bengaluru Printed at: Precision Fototype Services, Bengaluru
Please e-mail articles & feedback to: pkantha@isac.gov.in, anitha@isac.gov.in, upagraha@isac.gov.in

"Upagrah Editorial Board thanks all its readers for their continuous encouragement."